What is Claimed is:

1. A method of fabricating a compositionally modulated electrode in a magnetic tunnel junction device, comprising:

depositing a mask layer on a surface of a previously fabricated electrode of the magnetic tunnel junction device, the electrode including a first resistivity;

patterning a plasma mask in the mask layer;

forming the plasma mask in the mask layer so that a portion of the surface is exposed by the plasma mask;

forming a high resistivity region that extends inward of the surface by exposing the portion of the surface to a plasma process selected from the group consisting of a plasma oxidation process, a plasma nitridation process, and a plasma carburization process, the high resistivity region including a second resistivity that is higher than the first resistivity; and

removing the plasma mask from the surface of the electrode.

2. The method as set forth in Claim 1 and further comprising:

continuing the forming of the high resistivity region until the high resistivity region extends inward of the surface by a predetermined depth.

3. The method as set forth in Claim 1, wherein the plasma oxidation process comprises a gas plasma including a carrier gas comprising oxygen.

4. The method as set forth in Claim 1, wherein the plasma nitridation process comprises a gas plasma including a carrier gas comprising nitrogen.

5. The method as set forth in Claim 1, wherein the plasma carburization process comprises a gas plasma including a carrier gas comprising carbon.

6. The method as set forth in Claim 1, wherein the forming the plasma mask comprises a process selected from the group consisting of etching the mask layer and developing the mask layer.

7. The method as set forth in Claim 1, wherein the mask layer comprises a photoresist material.

8. The method as set forth in Claim 1 and further comprising:

continuing the forming of the high resistivity region until the second resistivity of the high resistivity region reaches a predetermined value of resistivity.

9. A method of fabricating a compositionally modulated electrode in a magnetic tunnel junction device, comprising:

depositing an alloy layer on a surface of a previously fabricated electrode of the magnetic tunnel junction device, the electrode including a first resistivity;

depositing a mask layer on the alloy layer;

patterning the mask layer to form an etch mask on the alloy layer;

etching the alloy layer to form an alloy patch on the surface;

removing the etch mask from the alloy patch; and

alloying the alloy patch with the electrode by applying heat to form a high resistivity region that extends inward of the surface, the high resistivity region including a second resistivity that is higher than the first resistivity.

10. The method as set forth in Claim 9 and further comprising:

continuing the alloying of alloy patch with the electrode until the high resistivity region extends inward of the surface by a predetermined depth.

11. The method as set forth in Claim 9, wherein the alloy layer comprises an electrically conductive material.

12. The method as set forth in Claim 11, wherein the electrically conductive material is a material selected from the group consisting of a metal, a metal alloy, a semiconductor material, a doped glass, a doped tetraethylorthosilicate, polysilicon, aluminum, tungsten, and copper.

13. The method as set forth in Claim 9 and further comprising:

continuing the alloying of alloy patch with the electrode until the second resistivity of the high resistivity region reaches a predetermined value of resistivity.

14. A magnetic tunnel junction device, comprising:

a data layer including an alterable orientation of magnetization;

an electrode in electrical communication with the data layer and including a first resistivity;

a high resistivity region including a second resistivity that is higher than the first resistivity, the high resistivity region is disposed in the electrode and is positioned substantially over the data layer and is operative to generate a joule heat in response to a write current flowing in the electrode and the joule heat is thermally conducted into the data layer and reduces a coercivity of the data layer so that a magnitude of a switching field operative to rotate the alterable orientation of magnetization is reduced;

a reference layer including a pinned orientation of magnetization;

a first electrode in electrical communication with the reference layer; and

a tunnel barrier layer positioned intermediate between the data layer and the reference layer.

15. The magnetic tunnel junction device as set forth in Claim 14, wherein the high resistivity region comprises a material selected from the group consisting of an alloy of a material of the electrode with a second material, a material of the electrode that has been plasma oxidized; a material of the electrode that has been plasma nitridized; and a material of the electrode that has been plasma carburized.

16. The magnetic tunnel junction device as set forth in Claim 15, wherein the second material is a material selected from the group consisting of a metal and a metal alloy.

17. The magnetic tunnel junction device as set forth in Claim 14 and further comprising:

a second electrode positioned adjacent to the first electrode and is electrically isolated from the first electrode, the second electrode is operative to generate a portion of the switching field in response to a write current flowing in the second electrode.

18. In a magnetic tunnel junction device including a data layer with an alterable orientation of magnetization, a reference layer with a pinned orientation of magnetization, a tunnel barrier layer positioned intermediate between the data layer and the reference layer, an electrode in electrical communication with the data layer and including a first resistivity, and a first electrode in electrical communication with the reference layer, the improvement comprising:

a high resistivity region including a second resistivity that is higher than the first resistivity, the high resistivity region is disposed in the electrode and is positioned substantially over the data layer and is operative to generate a joule heat in response to a write current flowing in the electrode and the joule heat is thermally conducted into the data layer and reduces a coercivity of the data layer so that a magnitude of a switching field operative to rotate the alterable orientation of magnetization is reduced.

19. The magnetic tunnel junction device as set forth in Claim 18, wherein the high resistivity region comprises a material selected from the group consisting of an alloy of a material of the electrode with a second material, a material of the electrode that has been plasma oxidized; a material of the electrode that has been plasma nitridized; and a material of the electrode that has been plasma carburized.

20. The magnetic tunnel junction device as set forth in Claim 19, wherein the second material is a material selected from the group consisting of a metal and a metal alloy.

21. The magnetic tunnel junction device as set forth in Claim 18 and further comprising:

a second electrode positioned adjacent to the first electrode and is electrically isolated from the first electrode, the second electrode is operative to generate a portion of the switching field in response to a write current flowing in the second electrode.